

TOP SCAB RESISTANCE ELITES, CANDIDATE IN OBTAINING NEW APPLE VARIETIES

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Abstract

The researches carried out at the Research and Development Station for Fruit Growing Voinești aimed to highlight the attributes of some new apple elite performance with genetic resistance to diseases obtained from the hybrid combinations performed in 1992 and between 2004-2005. Apple elites resulted from the selection of 3,728 hybrids of apples, obtained from the original material of great genetic diversity. All five selected apple elites candidate for new varieties, have a strong genetic scab resistance, high quality fruits and fulfill the present requirements of apple varieties. Elite H 8/86 - 92 obtained by the crossing of 'Prima' x 'Frumos de Voinești' is noted for its precocity, productivity and quality of fruits and has already been registered at ISTIS for testing and approval. Those resulted from the 'Goldenspur' x 'Florina' crossing hybridization, show fruits with size over 160 g, have a yellowish or yellowish-greenish colour and very good taste. Elites coming from crossing of 'Florina' x 'Idared' bear medium to large fruits, covered 2/3 of the surface with an attractive shiny red. All scab resistance apple elites prove economic efficiency, a high and constant yield, great appearance and taste.

Key words: breeding, hybridization, genetic diversity, resistance to diseases, fruit's performance.

INTRODUCTION

Apple's assortment experienced in the past decades a significant change (Braniste N and Unchiasu G., 2011), being promoted varieties that primarily target the producer's requirements, oriented mostly to economic efficiency, high production potential of the orchard, fruit appearance, consumption period and consumer preferences. These requirements are fulfilled by obtaining and extension of new apple varieties with genetic resistance to diseases (Cociu et al., 1999) appropriate in the same time both for the farmers and consumers. Breeding apple varieties (Petre V. and Petre Gh., 2011) is a long-term process and a very complex endeavour undertaken especially when these varieties enclose genetic resistance to disease (Braniste, 2011).

The continuous process of breeding has enabled in time a complex genetic selection heritage that can be utilised in controlled crossings, varieties or/and elites, which have embedded various resistance genes (Petre V. and Petre Gh., 2014).

The research carried out at RDSFG Voinești highlights the performance of some brand-new apple elites with genetic resistance to disease, candidate for new varieties.

MATERIALS AND METHODS

The large genetic basis existing at the Voinești Research and Development Station for Fruit Growing, consisting of selection fields, hybrids nursery and competition microcultures, was the main source for the selection of apple-tree elite with genetic resistance to diseases.

These selections have been previously studied in terms of fruit productivity and quality, criteria imposed for the DUS (Distinctness, Uniformity, Stability) and VCU (Value for cultivation and use) tests required to obtain Plant Breeders' Rights for the new varieties.

In order to emphasize the performance attributes of the apple elites, a regular and optimal technology has been applied in the orchard, taking care not to affect the production capacity and quality of the fruits.

The researches focused on observations and determinations made on resistance to disease and pest attack as well as for the yielding and fruits quality of the hybrid combinations carried out in 1992 and the 2004 - 2005 period.

RESULTS AND DISCUSSIONS

The breeding goals involve annually creation of new selection bases consisting of hybrid seedlings with complex variability. Maternal and paternal genitors as varieties are carefully chosen, so that the term of obtaining new valuable selections to decrease.

Success in breeding is largely conditioned by the clarity of the proposed objectives, but at the same time is dependent on the availability and knowledge of genetic resources. Creating a wide pool of variability and genetic diversity significantly increase the chance to reach the desired variety ideotip.

Selected apple elites in order to candidate for approval as new varieties in addition to the attributes of productivity, high fruit quality, genetic resistance to diseases, has to comply also with the following traits depending on the cultural area conditions:

- resilience to climatic conditions;
- production direction;
- market demand for the production engaged;
- safeguarding of the best planting material by nurseries;
- cost-efficiency ratio of the technology.

Using suitable parental genitors that own genes for resistance to diseases and high productivity facilitate the breeder selection in descendances. All the other essential traits can be highlighted only on the basis of further research.

The apple breeding programme outcomes are presented bellow in the table 1.

Table 1. Results of the different apple breeding crossings made at RDSFG Voinești in 1992 and 2004-2005 period

No.	Hybrid combination	Number of pollinated flowers	Number of hybrid fruits obtained	Number of hybrid seeds sown	Seedlings	
					no	%
	Year 1992					
1	Prima x Frumos de Voinești	685	175	720	468	65,0
	Year 2004					
1	Florina x Idared	450	80	341	216	63,3
2	Florina x H 3/5-90	60	9	49	16	32,1
3	Goldspur x Florina	422	117	854	280	32,7
4	Florina x H 1/12	235	33	132	75	56,8
	Year 2005					
1	Generos x H 1/53	380	87	604	525	86,9
2	Goldspur x H 2/44	390	280	1520	1220	80,3
3	Goldspur x Florina	650	274	1287	928	72,1
	TOTAL	3272	1055	4787	3728	77,88

Apple hybrid seedlings (fig. 1) were obtained by controlled crossings between the following genitors:

- sensitive varieties: 'Idared', 'Goldspur' and 'Frumos de Voinești';
- resistant varieties: 'Florina', 'Prima' and, varieties of foreign origin, having the resistance gene Vf; 'Generos' obtained at RDSFG Voinești, tolerant to scab, owning the resistance gene *Poly*;
- elites with genetic resistance to diseases (Vf), selected at RDSFG Voinești: H 3 / 5-90; H 1/53; H 2/44, H 1/12.

In 1992 and 2004-2005 period, eight crossings have been effectuated. From 3272 pollinated flowers, it were obtained 1055 hybrid fruits. From these, 4787 hybrid seeds have been extracted and 3728 apple seedlings issued. All of them were moved in the nursery for fortification and afterwards transferred in the selection field.

During the experimentation period a very genetic diverse material have been created. This allow us to obtain good apple selections with valuable and superior characteristics. It were yearly selected only apple hybrids with

genetic resistance to diseases and high-quality fruits according to the foreseen objectives. These ones have been grafted in the nursery and consist later on as trees in microcultures competition.

Increasing genetic variability by using as genitors the varieties and elites with genetic resistance to diseases encompass genes with complex resistance.



Figure 1. Apple hybrid seedlings raised in jiffy-pots

The apple elites with genetic resistance to diseases are subject to the next description as follows:

Elite H 8/86-92 ('Prima' x 'Frumos de Voinesti')

Trees are medium vigorous, very precocious and productive, type 3 fructification (spur and long branches), Blossom is medium with a good overlapping with most of the cultivated apple varieties. Fruits are medium in size (165 g), with a conic shape statue (figure 2).

The skin has a yellow colour in the background covered with carmine-red colour on 2/3 of the surface (figure 3). Flesh is white to yellow, sweet and with pleasant acidity, juicy and very tasty. Harvest time: first half of September. Is scab resistant and low sensitive to mildew.



Figure 2. Elite H 8/86-92 fruit shape



Figure 3. Elite H 8/86-92 fruits colour

Elite H 14/311-05 ('Goldenspur' x 'Florina')

Trees are medium in vigour, scab resistant, precocious with spur fructification type. Blossom is medium and in the middle of other common apple varieties flowering period. Fruits are medium in size (165 g), round shaped (figure 4) with a yellow- greenish skin colour. Fruits flesh is white to yellow, crunchy, with a very good taste, similar to Golden delicious. The soluble solids content is over 14%. Harvest take place in the beginning of October and the consumption period extends till 1st of March.



Figure 4. Elite H 14/311-05

Elite H 4/38-05 ('Goldenspur' x 'Florina')

The tree is Vf resistant, medium vigorous, precocious, fruiting on spurs. The blossom is medium to late.

The fruits are 160g in size, conical shape with entirely yellow skin (figure 5). The flesh is also yellowish, crunchy and taste is very good and balanced.

Harvest time is starting in first decade of October and the fruits could be consumed until April.



Figure 5. Elite H 4/38-05

Elite H 1/59-04 ('Florina' x H1/12)

Trees are resistant to *Venuria inaequalis* and *Podosphaera leucotricha*, medium vigorous with spur fructification.

The blossoming is early to medium as period. Fruits are about 165g weight (figure 6), spherical, yellow-greenish with uniform distribution of skin colour.

Picking starts in first days of October and storability by mid of April.



Figure 6. Elite H 1/59-04

Elite H 3/37-04 ('Florina' x 'Idared')

Trees are scab resistant, tolerant to mildew, medium in vigour, very precocious and with standard fructification.

Blossoming is medium too. Average fruit size is about 160g, covered by yellow with 2/3 of skin surface in shiny red (figure 7).

Apples have plenty of whitish lenticels all over the fruit. Flesh is yellowish, crunchy and very tasty. Harvest starts in first decade of October and fruits can be stored till end of April.



Fig. 7. Elite H 3/37-04

Elite H 4/17-05 ('Goldenspur' x 'Florina')

Tree is scab resistant, low to medium vigorous, precocious, with mostly spur fructification. Blossoming is medium to late.

Fruits are medium in size (165 g), conical and full coloured in deep yellow over the entire skin. Flesh is yellowish, crunchy with excellent taste.

First pick is in beginning of October and fruits could be consumed till 15th of March.



Figure 8. Elite H 4/17-05

CONCLUSIONS

In 1992 and between 2004-2005 period, at RSFG Voinesti, it has been obtained a very valorous apple material characterized by a large genetic variability that allow selections of valuable elites, candidate for new apple varieties or genitors for further breeding activities.

All six elites are scab resistant and match the producer's requirements such as economic efficiency, productivity, very good quality of fruits etc.

The apple elites fill the gaps in the existing apple assortment and enhance the fruit conveyor of Dambovită Basin.

Promoting scab resistant apple varieties, we take care of environment, increase the economic value of production and gather bigger lots of fruits with less pesticide residues.

REFERENCES

- Braniște, N., Unchiasu, G. (2011). *Determinator pentru soiuri de mere*, Editura CERES.
- Braniște, N. (2011). Programul european de conservare a resurselor genetice din agricultură (EURISCO DB și AEGIS). *Determinator pentru soiuri de mere*, Editura CERES.
- Cociu, V., Botu, I., Șerboiu, L. (1999). *Progrese în ameliorarea plantelor horticoale din România*. Vol.I., Pomicultura. Edit. Ceres, București.

Petre, V., Petre, Gh. (2011). Promovarea unei metodologii pentru scurtarea duratei de creare a soiurilor de măr cu rezistență genetică la boli. *Sesiunea de referate a ICDP Mărăcineni*.

Petre, V., Petre, Gh. (2014). Contributions regarding the apple trees genetic variability increase in the process of obtaining improving biological material. *Scientific papers. Series B. Horticulture*. Volume LVIII, 71-74.